

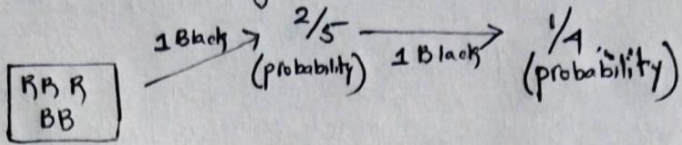
BAYE'S THEOREM

- i) Conditional Probability
- ii) Independent event
- iii) Dependent events

Independent events → When the two events are independent of each other, they are known as independent event.

For example - Tossing of a coin. $P = 0.5$

Dependent events → Suppose in a bag of marbles we have 5 marbles. (3 Red, 2 Black)



Here in dependent events, probability keep changing but in case of independent events probability is constant.

Conditional probability →
$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$
 $A \rightarrow \text{Event 1}$ $B \rightarrow \text{Event 2}$

This mean we have to find the probability (A) given P(B) is already happen.

It is also a type of Dependent events.

Bag (3 Red, 2 Black) → Event 1. Taking out 1 B $P(A) = \frac{2}{5}$ → Event 2. Taking out 1 Black again $P(B|A) = \frac{1}{4}$

$P(A \cap B) = P(B|A) * P(A) = \frac{2}{5} * \frac{1}{4} = \frac{1}{10}$

$P(A \text{ and } B \text{ both event taking place})$

$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{1/10}{2/5} = \frac{1}{4}$ so by this formula we can find probability of an event given that an event already happened.

Baye's theorem → $P(A|B) = \frac{P(A \cap B)}{P(B)}$ or $P(B|A) = \frac{P(B \cap A)}{P(A)}$

$P(A \cap B) = P(A|B) * P(B)$ $P(B \cap A) = P(B|A) * P(A)$

$P(A|B) * P(B) = P(B|A) * P(A)$ → Likelihood probability

$P(A|B) = \frac{P(B|A) * P(A)}{P(B)}$ → prior probability

This is the baye's theorem example

Example of Baye's theorem, Example

Outlook → Sunny, overcast, rainy. Temperature → hot, mild, cold, play → yes, No.

Find the probability today we will play or not?

Today → Sunny, hot $P(\text{yes} | \text{today}) = \frac{[P(\text{Sunny} | \text{yes}) * P(\text{hot} | \text{yes})] * P(\text{yes})}{P(\text{Today})}$

Naive meaning shows a lack of experience/judgement.

Naive Bayes is naive because it makes the assumption that features of a measurement are independent of each other. This is naive because it is (almost) never true.